

PATENT ABSTRACTS OF JAPAN

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(71)Applicant : NIPPON TELEGR & TELEPH CORP <NTT>

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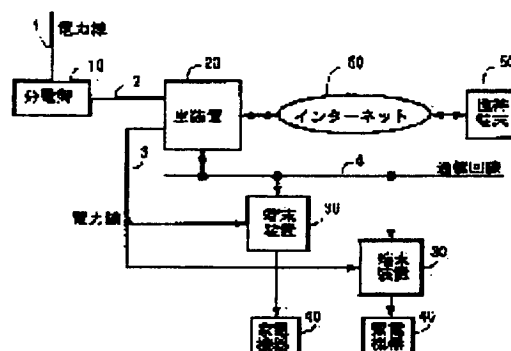
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(54) POWER CONTROL SYSTEM FOR INDOOR EQUIPMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To reduce the peak of power consumption by ensuring an electric power source for a necessary equipment within a contract power by disconnecting other electric equipment.

SOLUTION: This system is equipped with a terminal device 30 provided with a switch circuit 302 carrying a current to a home electric equipment 40 and interrupting it and a main device 20 connected between a distribution panel 10 and the terminal device 30 to perform control of carrying/interrupting of a current in the home electric equipment 40 and monitoring of power consumption through the terminal device 30. The main device 20 controls the terminal device 30 in accordance with a relation between a duty cycle of power and a priority order of the home electric equipment 40.



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CLAIMS

[Claim(s)]

[Claim 1] In the inside-of-a-house device power control system which controls two or more household-electric-appliances devices installed in domestic according to the capacity of a home power receiving breaker Two or more terminal units possessing the switching circuit which performs energization/cutoff to said each household-electric-appliances device, The main unit which is connected between a panelboard and said each terminal unit, and performs the control and the power consumption monitor of energization/cutoff of said each household-electric-appliances device through said terminal unit is provided. This main unit The inside-of-a-house device power control system characterized by controlling said terminal unit according to the relation between a power activity ratio and the priority of each of said household-electric-appliances device.

[Claim 2] It is the inside-of-a-house device power control system characterized by providing the screen possessing the display and the touch actuation input section as which said main unit displays operator guidance, a condition, etc. in an inside-of-a-house device power control system according to claim 1, and IF circuit for a communication link connected to a personal digital assistant via the Internet.

[Claim 3] It is the inside-of-a-house device power control system characterized by providing a means to notify a request of manual cutoff of energization of said household-electric-appliances device to said personal digital assistant via said IF circuit for a communication link when, as for said main unit, a power activity ratio exceeds a predetermined value in an inside-of-a-house device power control system according to claim 2.

[Claim 4] It is the inside-of-a-house device power control system characterized by providing the power control circuit which changes the electric supply for said main unit actuation from said panelboard to said auxiliary power when the auxiliary power to which said main unit operates in claim 1 thru/or the inside-of-a-house device power control system of any one publication of three at the time of interruption of service is provided and said power activity ratio exceeds said predetermined value.

[Claim 5] It is the inside-of-a-house device power control system which sets to claim 1 thru/or the inside-of-a-house device power control system of any one publication of four, and is characterized by said main unit possessing the switching equipment which changes the electric supply path to said each household-electric-appliances device according to the capacity of each **** breaker of said panelboard, and the consumed electric current of each of said household-electric-appliances device.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the system which controls power allocation to an inside-of-a-house device.

[0002]

[Description of the Prior Art] Conventionally, as for the contract demand (capacity of a power receiving breaker) with the electric power company in ordinary homes, below the total device use power has been criteria. A household-electric-appliances device newly, and when bursty use beyond the contract demand capacity is performed intentionally, a power receiving breaker will be in the condition of cutoff, and no use of household-electric-appliances devices will become impossible [a breaker]. In order to prevent this, it needed to warn against exceeding the capacity which the electric supply sum total power capacity (the amount of sum total currents) of the household-electric-appliances device to be used made a contract of, and contract demand needed to be raised, using a household-electric-appliances device.

[0003] Moreover, since the power control system of the conventional household-electric-appliances device was the technique and system for realizing energy saving, control which realizes intentional power use which the user himself performs was not completed.

[0004]

[Problem(s) to be Solved by the Invention] While it is assumed that unitary management of the household-electric-appliances device of each home like an information appliance house will be performed in the future, we are anxious about large AFFU of the power capacity by installation of the equipment which performs control of each household-electric-appliances device, a monitor, the notice of failure, etc. the limitation of energy reduction aiming at global environmental protection although a problem will be solved if the amount of contract demand with an electric power company is made to increase, and the electric-power-plant capacity of an electric power company, and the point of financial pressure of each home -- a large -- it is clear to become a **** problem.

[0005] The purpose of this invention is offering the inside-of-a-house device power control system which enabled it to reduce the peak value of power consumption by securing the power source of a need device within contract demand, and disconnecting the other power source.

[0006]

[Means for Solving the Problem] In the inside-of-a-house device power control system which controls two or more household-electric-appliances devices by which invention concerning claim 1 was installed in domestic according to the capacity of a home power receiving breaker Two or more terminal units possessing the switching circuit which performs energization/cutoff to said each household-electric-appliances device, The main unit which is connected between a panelboard and said each terminal unit, and performs the control and the power consumption monitor of energization/cutoff of said each household-electric-appliances device through said terminal unit is provided. This main unit It considered as the inside-of-a-house device power control system characterized by controlling said terminal unit according to the relation between a power activity ratio and the priority of each of said household-electric-appliances device.

[0007] Invention concerning claim 2 used said main unit as the inside-of-a-house device power control system characterized by providing the screen possessing the display and the touch actuation input section which display operator guidance, a condition, etc., and IF circuit for a communication link connected to a personal digital assistant via the Internet in the inside-of-a-house device power control system according to claim 1.

[0008] In the inside-of-a-house device power control system according to claim 2, invention concerning claim 3 used said main unit as the inside-of-a-house device power control system characterized by providing a means to notify a request of manual cutoff of energization of said household-electric-appliances device to said personal digital assistant via said IF circuit for a communication link, when a power activity ratio exceeded a predetermined value.

[0009] In claim 1 thru/or the inside-of-a-house device power control system of any one publication of three, invention concerning claim 4 used said main unit as the inside-of-a-house device power control system characterized by providing the power control circuit which changes the electric supply for said main unit actuation from said panelboard to said auxiliary power, when the auxiliary power which operates at the time of interruption of service was provided and said power activity ratio exceeded said predetermined value.

[0010] Invention concerning claim 5 was set to claim 1 thru/or the inside-of-a-house device power control system of any one publication of four, and used said main unit as the inside-of-a-house device power control system characterized by providing the switching equipment which changes the electric supply path to said each household-electric-appliances device according to the capacity of each **** breaker of said panelboard, and the consumed electric current of each of said household-electric-appliances device.

[0011]

[Embodiment of the Invention] Drawing 1 is the block diagram showing the whole inside-of-a-house device power control-system configuration of one operation gestalt of this invention. The panelboard which supplies electricity to the power line 2 in the power which 10 received with the power line 1 from the outdoors, and 20 are the main units which perform a change and others of the electric supply path from the power line 2 to the power line 3. 30 is a terminal unit to which the household-electric-appliances device 40 is connected, and performs control and others of the electric supply/cutoff to the household-electric-appliances device 40 of the power to which electricity is supplied with the power line 3 from the main unit 20. 50 is a personal digital assistant and is connected with the main unit 20 via the Internet 60. 4 is a communication wire for control, a monitor, etc., and connects between the main unit 20 and two or more terminal units 30.

[0012] Drawing 2 was the block diagram showing the concrete configuration inside the main unit 20 connected to a panelboard 10, and when the power line 2 was three, 2A, 2B, and 2C, it showed the case where the power line 3 was three, 3A, 3B, and 3C. The

switching equipment 201 with which the main unit 20 controls the change of connection of the three power lines 2 and the three power lines 3, The switch control circuit 202 which controls the switch section of this switching equipment 201, The dc-battery 203 as system auxiliary power used at the time of interruption of service, and the power control circuit 204 which performs control as which receive the electric supply from switching equipment 201, a dc-battery 203 is charged, or a dc-battery 203 is operated as auxiliary power, CPU205 which performs data processing, data transfer, an operation, others, etc., and controls the whole (central-process section), The memory 206 in which the program of control of this system etc. is stored, and the storages 207, such as the floppy (trademark) disk unit and hard disk drive unit with which various data, such as the set point, are stored, and an optical disk unit, The screen 208 equipped with the liquid crystal display section and the touch actuation input section which display operator guidance, a condition, etc., The screen-display circuit 209 which controls the display of this screen 208, and the IF (interface) circuit 210 for a communication link possessing the modem which performs the communication link with the Internet 60, It has the terminal unit control circuit 211 which performs electric supply for actuation to two or more terminal units 30 while exchanging a signal among two or more terminal units 30, a bus line 212, and electric supply (power source) Rhine 213-217.

[0013] Drawing 3 is the block diagram showing the concrete configuration of the switching equipment 201 of the above-mentioned main unit 20. Switching equipment 201 possesses the switch sections 2011A, 2011B, and 2011C of three contacts which change the connection (electric supply path) with the power lines 3A, 3B, and 3C connected to power-line 2A connected to a panelboard 10, 2B, and 2C and a terminal unit 30 by the control signal a3 from the switch control circuit 202. Namely, power-line 2A, 2B, and 2C are respectively connectable with the power lines 3A, 3B, and 3C. Power-line 2A, 2B, and the power lines 3A, 3B, and 3C linked to 2C are chosen by the change of the switch sections 2011A, 2011B, and 2011C so that the current of power-line 2A, 2B, and 2C may not exceed default value (power-line 2A of a panelboard 10, 2B, each breaker capacity of 2C). When the two or more power lines of an output side are connected to the one power line of an input side at this time, the power lines 3A and 3B may be connected to power-line 2A.

[0014] the household-electric-appliances device IF terminal 304 which connects the load side of the terminal unit IF circuit 301 where drawing 4 is the block diagram showing the concrete configuration of a terminal unit 30, and is connected to the terminal unit control circuit 211 of said main unit 20 carried out, the switching circuit 302 where it is connected with the power line 3, and ON/OFF is controlled by the terminal unit IF circuit 301, the power detecting circuit 303 which detect the load current to which it flows to a switching circuit 302, and a switching circuit 302 to a household-electric-appliances device 40 -- ** -- it provides.

[0015] Now, system behavior follows the data thrown in in early stages. As shown in drawing 5, from Screen 208 or the personal digital assistant 50 of the main unit 20, registration of this data inputs the use priority of the household-electric-appliances device 40, threshold [of a power activity ratio (ratio of the working current / as opposed to contract current capacity in practice /)] a, and b (%) (%), and stores them in a storage 207. Read-out in the data writing and memory 206 to this storage 207 is performed by CPU205.

[0016] Supposing the use priority of the above-mentioned household-electric-appliances device has four sets of the household-electric-appliances devices 40A, 40B, 40C, and 40D, like $40B > 40C > 40D > 40A$, household-electric-appliances device 40B of priority is the highest, and household-electric-appliances device 40A will set it up here so that priority may become low most. The threshold a of a power activity ratio is a threshold which performs notice of a change request, and compulsive switching, and is set up in 1-99 (%). The threshold b of a power activity ratio is a threshold which performs the notices of a condition (warning etc.), and is set up in 1-99 (%). a and b have the relation of $a > b$. Here, it sets up to $a = 99\%$ and $b = 90\%$.

[0017] As basic actuation, CPU205 performs individually ON / off control of the switching circuit 302 of each terminal unit 30 through a control signal a2 by program manipulation and control of the terminal unit control circuit 211 based on the power consumption information signal a1 of the household-electric-appliances device 40 from each terminal unit 30 which the terminal unit control circuit 211 received, and the thresholds a and b which the user set up. moreover, said power consumption information signal a1 with which the terminal unit control circuit 211 received CPU205 -- ** -- by **, program manipulation, and control of the switch control circuit 202 just Through a control signal a3 by controlling the switching equipment 201. An electric supply path is changed, each current value is adjusted so that a current may not concentrate on the specific thing of power-line 2A, 2B, and 2C, and method control of ***** of the activity ratio is carried out to near 100% of a contract demand value.

[0018] As a display action, Screen 208 displays an alphabetic character, drawing, an image, an image, handwriting information, etc. by the screen-display circuit 209. If a loudspeaker is attached at this time, the notice of voice can also be performed. When the change of the case where the thresholds a and b of the set-up power activity ratio are exceeded, or a switching circuit 302 is performed, a systems operation condition is displayed on Screen 208 by the display control of the program manipulation by CPU205, or the screen-display circuit 209. Moreover, when especially a power activity ratio exceeds a threshold a, CPU205 displays an electric supply cutoff request of a household-electric-appliances device on Screen 208 by the display control of program manipulation or the screen-display circuit 209. In addition, a setup of this system, control, and employment condition read-out are also possible by the touch actuation to Screen 208.

[0019] As communication link actuation, the IF circuit 210 for a communication link has the modem function which makes INTANETTOHE connection, and performs the condition of this systems operation, the notice of an electric supply cutoff request of a household-electric-appliances device, etc. to a personal digital assistant 50 like the display control of Screen 208 through signal transmission a4 and the Internet 60 by the program manipulation in CPU205, or control of the IF circuit 210 for a communication link. This system is also controllable from a personal digital assistant 50 through this IF circuit 210 for a communication link.

[0020] As power-source actuation, CPU205 makes cutoff of electric supply Rhine 214 to the power control circuit 204, connection of electric supply Rhine 215 from a dc-battery 203, or connection of cutoff of electric supply Rhine 215, and electric supply Rhine 214 by program manipulation and control of the power control circuit 204 based on the power consumption information signal a1 which the terminal unit control circuit 211 received. Moreover, as long as the power control circuit 204 supplies electric power to each electronic circuitry through electric supply Rhine 213 and has electric supply by electric supply Rhine 214 of switching equipment 201, it charges to a dc-battery 203 through electric supply Rhine 216. The terminal unit control circuit 211 performs electric supply for equipment actuation to each terminal unit 30 through electric supply Rhine 217.

[0021] Next, actuation is explained. The control explanatory view of a power busy condition [in / in drawing 6 / this actuation] and drawing 7 are the flow charts of the actuation. Here, as described above, the thresholds a and b of the power activity ratio applied by the processings 701, 705, 706, 712, and 713 in the flow chart of drawing 7 are made into $a = 99\%$ and $b = 90\%$, and as the use priority of the household-electric-appliances devices 40A, 40B, 40C, and 40D was also described above, they are set to $40B > 40C > 40D > 40A$. At this time, it supposes that there is nothing the control which used the personal digital assistant 50 from a user, and suppose that the processings 704 and 711 of the flow chart of drawing 7 are not operated.

[0022] In drawing 6, if start electric supply (electric supply to the main unit 20 and a terminal unit 30) of this system at time of day t1, and electric power is supplied in household-electric-appliances device 40A at time of day t2, is supplied in household-electric-

appliances device 40B at time of day t3 and is supplied in household-electric-appliances device 40C at time of day t4, a power activity ratio will exceed the setting threshold b (= 90%) at this time of day t4. For this reason, step 701 of drawing 7 serves as YES, and processing 702 it is notified to a user with the personal digital assistant 50 which receives the signal transmission a4 from Screen 208 and the IF circuit 210 for a communication link that warning of that the household-electric-appliances devices to which electric power is supplied now are 40A, 40B, and 40C, and the power activity ratio having exceeded the threshold b is performed.

[0023] If the electric supply to household-electric-appliances device 40D is started at time of day t5, in order that a power activity ratio may exceed the setting threshold a (= 99%), step 706 of drawing 7 serves as YES. This sake, A signal a2 is minded from the processing 707 which changes the electric supply to each electronic circuitry by electric supply Rhine 213 of the main unit 20 to electric supply by electric supply Rhine 215 from a dc-battery 203 by time-of-day t5', and the terminal unit control circuit 211. The signal transmission a4 and Screen 208 from processing 708 and the IF circuit 210 for a communication link which cut the switching circuit 302 of the terminal unit 30 connected to the household-electric-appliances device (an electric power switch is off) of electric supply at last are minded. Processing 710 of the notice of an electric supply cutoff request about the household-electric-appliances devices 40A, 40B, 40C, and 40D which is carrying out current electric supply is performed.

[0024] Processing 713 which intercepts the switching circuit 302 of the terminal unit 30 to which household-electric-appliances device 40A with the lowest priority is connected through the control signal a2 according to the priority of the household-electric-appliances devices 40A, 40B, 40C, and 40D at time of day t6 is performed. While processing 714 which will change the electric supply to each electronic circuitry of the main unit 20 to electric supply from electric supply Rhine 214 by actuation of this processing 713 if a power activity ratio becomes below the setting threshold b (90%) including electric supply of each electronic-circuitry HE of the main unit 20 is performed, processing 715 of the notice of an electric supply cutoff result to a user is performed through signal transmission a4 and Screen 208.

[0025] In addition, when there is an electric supply cutoff instruction of a household-electric-appliances device from a user, it progresses to processing 705 or processing 712 of the comparison with a power activity ratio with processing 704 or processing 711. Subsequent flow is as being shown in a flow chart.

[0026] In addition, although the above-mentioned operation gestalt explained the example which set aside the power line 3 and a communication line 4, it is also possible to communalize a both line by the power-line communication technology represented by EKONETTO. Moreover, the threshold b of a power activity ratio is set up two or more, and can attach a gravity to warning.

[0027]

[Effect of the Invention] As mentioned above, according to this invention, since peak value reduction of domestic power consumption can be performed and peak value reduction of the power consumption of the whole society is still attained, there is an advantage that reduction of domestic fuel and light prices, the facility cost reduction of an electric power company, reduction of the power rate by facility cost reduction, and reduction of discharge carbon dioxides can be performed.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram of an inside-of-a-house device power control system.

[Drawing 2] It is the block diagram of the concrete configuration of the main unit.

[Drawing 3] It is the block diagram of the concrete configuration of the switching circuit in the main unit.

[Drawing 4] It is the block diagram of the concrete configuration of a terminal unit.

[Drawing 5] It is the explanatory view of initial-data registration.

[Drawing 6] It is the explanatory view of power control.

[Drawing 7] It is the flow chart of power control.

[Description of Notations]

1, 2, 2A, 2B, 2C, 3, 3A, 3B, 3C: Power line

4: Communication line

10: Panelboard

The main unit, 201:switching equipment, 2011A-2011C : 20: The switch section, 202: A switch control circuit, a 203:dc-battery, 204 : A power control circuit, 205: CPU, 206:memory, a 207:storage, 208 : A screen, 209: A screen-display circuit, IF circuit for 210:communication links, a 211:terminal-unit control circuit, a 212:bus line, 217[213 -]:electric-supply Rhine, an a1:power-consumption information signal, an a2:control signal, an a3:control signal, a4: Signal transmission
30: A terminal unit, a 301:terminal unit IF circuit, a 302:switching circuit, 303 : power detecting circuit
40: A household-electric-appliances device, 40A-40D : household-electric-appliances device
50: Personal digital assistant
60: Internet

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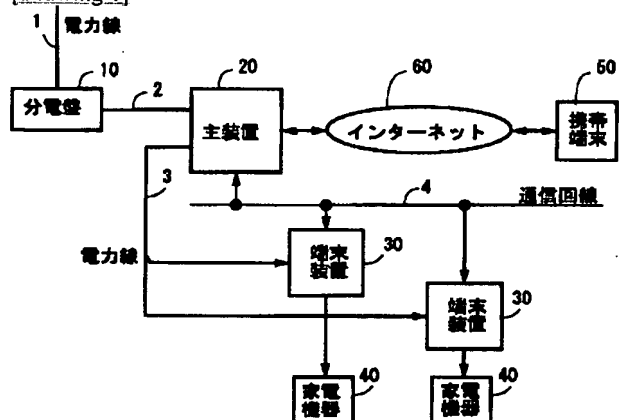
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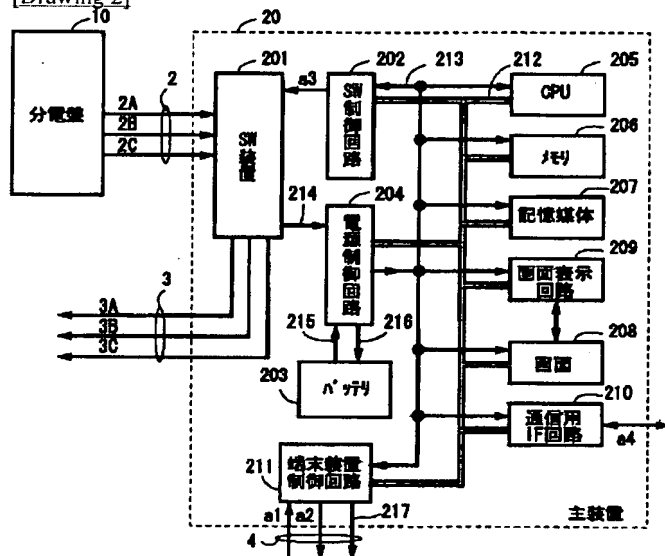
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DRAWINGS

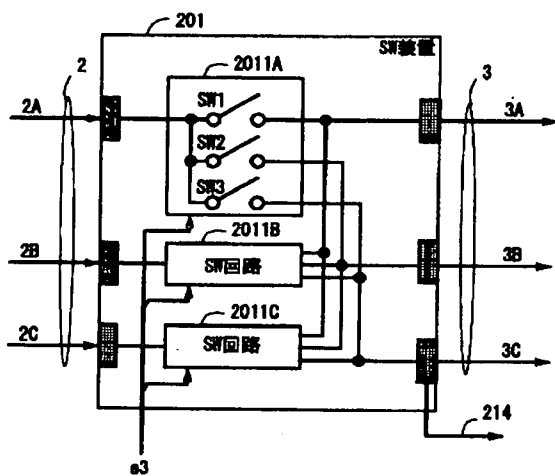
[Drawing 1]



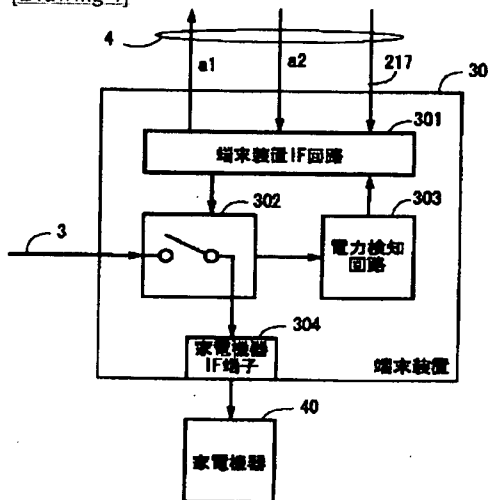
[Drawing 2]



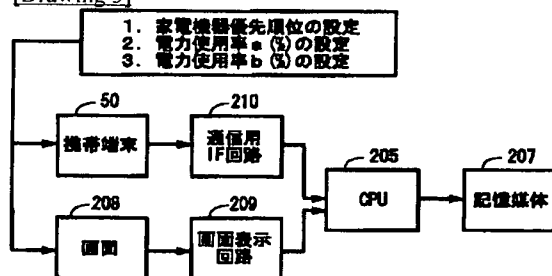
[Drawing 3]



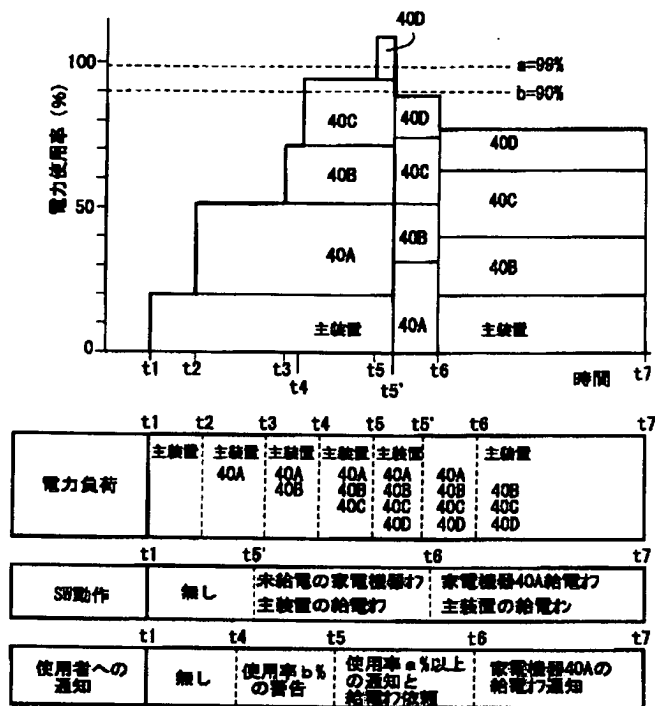
[Drawing 4]



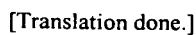
[Drawing 5]



[Drawing 6]



[Drawing 7]



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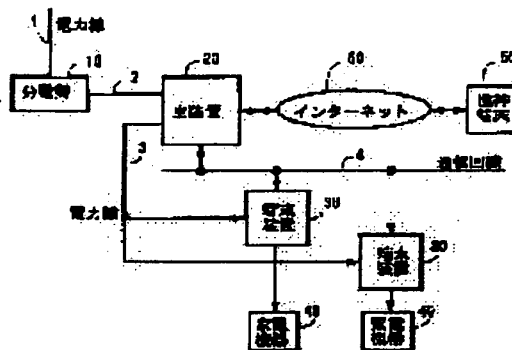
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(54) POWER CONTROL SYSTEM FOR INDOOR EQUIPMENT

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PROBLEM TO BE SOLVED: To reduce the peak of power consumption by ensuring an electric power source for a necessary equipment within a contract power by disconnecting other electric equipment.

SOLUTION: This system is equipped with a terminal device 30 provided with a switch circuit 302 carrying a current to a home electric equipment 40 and interrupting it and a main device 20 connected between a distribution panel 10 and the terminal device 30 to perform control of carrying/interrupting of a current in the home electric equipment 40 and monitoring of power consumption through the terminal device 30. The main device 20 controls the terminal device 30 in accordance with a relation between a duty cycle of power and a priority order of the home electric equipment 40.



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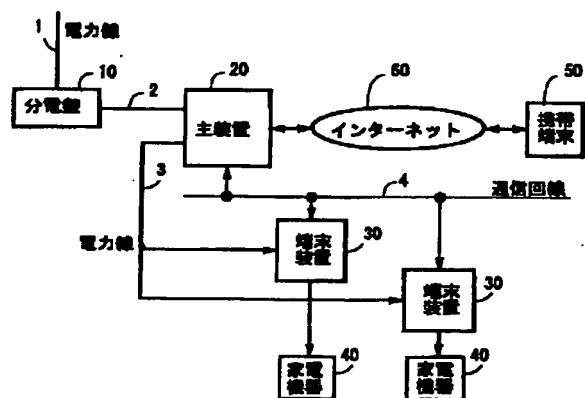
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(54) 【発明の名称】 屋内機器電力制御システム

(57) 【要約】

【課題】 契約電力以内で必要機器の電源を確保しそれ以外の電源を切断することで、電力消費のピーク値を低減する。

【解決手段】 家電機器40への通電/遮断を行うスイッチ回路302を具備する端末装置30と、分電盤10と端末装置30との間に接続され端末装置30を介して家電機器40の通電/遮断の制御及び消費電力監視を行う主装置20とを具備する。主装置20は、電力使用率と家電機器40の優先順位との関係に応じて端末装置30を制御する。



【特許請求の範囲】

【請求項1】家庭用受電ブレーカの容量に合わせて家庭内に設置された複数の家電機器を制御する屋内機器電力制御システムにおいて、

前記各家電機器への通電／遮断を行うスイッチ回路を具備する複数の端末装置と、分電盤と前記各端末装置との間に接続され前記端末装置を介して前記各家電機器の通電／遮断の制御及び消費電力監視を行う主装置とを具備し、

該主装置は、電力使用率と前記各家電機器の優先順位との関係に応じて前記端末装置を制御することを特徴とする屋内機器電力制御システム。

【請求項2】請求項1に記載の屋内機器電力制御システムにおいて、

前記主装置は、操作指示や状態等を表示する表示部及びタッチ操作入力部を具備する画面と、インターネット経由で携帯端末に接続する通信用ＩＦ回路を具備することを特徴とする屋内機器電力制御システム。

【請求項3】請求項2に記載の屋内機器電力制御システムにおいて、

前記主装置は、電力使用率が所定値を超えたとき、前記家電機器の通電の手動遮断の依頼を前記通信用ＩＦ回路を経由して前記携帯端末に通知する手段を具備することを特徴とする屋内機器電力制御システム。

【請求項4】請求項1乃至3のいずれか1つに記載の屋内機器電力制御システムにおいて、

前記主装置は、停電時に動作する補助電源を具備し、前記電力使用率が前記所定値を超えたとき、前記主装置動作の給電を前記分電盤から前記補助電源に切り替える電源制御回路を具備することを特徴とする屋内機器電力制御システム。

【請求項5】請求項1乃至4のいずれか1つに記載の屋内機器電力制御システムにおいて、

前記主装置は、前記分電盤の個々の分電ブレーカの容量と前記各家電機器の消費電流に応じて前記各家電機器への給電経路を切り替えるスイッチ装置を具備することを特徴とする屋内機器電力制御システム。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、屋内機器への電力配分を制御するシステムに関するものである。

【0002】

【従来の技術】従来、一般家庭における電力会社との契約電力（受電ブレーカの容量）は、総機器使用電力以下が基準となっている。新たに家電機器を購入し、その契約電力容量を超えたパースト的な使用を意図的に行った場合、受電ブレーカは遮断の状態となり、全ての家電機器の使用ができなくなる。これを防ぐためには、使用する家電機器の給電合計電力容量（合計電流量）が契約した容量を越えないよう注意して家電機器を使用するか、

契約電力を上げる必要があった。

【0003】また、従来の家電機器の電力制御システムは、省エネを実現するための技術やシステムであったため、使用者自らが行う意図的な電力使用を実現する制御はできなかった。

【0004】

【発明が解決しようとする課題】将来、情報家電ハウスの様な各家庭の家電機器の一元管理が行われることが想定されるなか、各家電機器の制御、監視、故障通知等を行う装置の導入による電力容量の大幅アップが懸念されている。電力会社との契約電力量を増加させれば問題は解決するのだが、世界的な環境保護を目的としたエネルギー削減、電力会社の発電能力の限界、各家庭の財務圧迫の点で大きな問題となるのは明らかである。

【0005】本発明の目的は、契約電力以内で必要機器の電源を確保し、それ以外の電源を切断することで、電力消費のピーク値を低減できるようにした屋内機器電力制御システムを提供することである。

【0006】

【課題を解決するための手段】請求項1にかかる発明は、家庭用受電ブレーカの容量に合わせて家庭内に設置された複数の家電機器を制御する屋内機器電力制御システムにおいて、前記各家電機器への通電／遮断を行うスイッチ回路を具備する複数の端末装置と、分電盤と前記各端末装置との間に接続され前記端末装置を介して前記各家電機器の通電／遮断の制御及び消費電力監視を行う主装置とを具備し、該主装置は、電力使用率と前記各家電機器の優先順位との関係に応じて前記端末装置を制御することを特徴とする屋内機器電力制御システムとした。

【0007】請求項2にかかる発明は、請求項1に記載の屋内機器電力制御システムにおいて、前記主装置は、操作指示や状態等を表示する表示部及びタッチ操作入力部を具備する画面と、インターネット経由で携帯端末に接続する通信用ＩＦ回路を具備することを特徴とする屋内機器電力制御システムとした。

【0008】請求項3にかかる発明は、請求項2に記載の屋内機器電力制御システムにおいて、前記主装置は、電力使用率が所定値を超えたとき、前記家電機器の通電の手動遮断の依頼を前記通信用ＩＦ回路を経由して前記携帯端末に通知する手段を具備することを特徴とする屋内機器電力制御システムとした。

【0009】請求項4にかかる発明は、請求項1乃至3のいずれか1つに記載の屋内機器電力制御システムにおいて、前記主装置は、停電時に動作する補助電源を具備し、前記電力使用率が前記所定値を超えたとき、前記主装置動作の給電を前記分電盤から前記補助電源に切り替える電源制御回路を具備することを特徴とする屋内機器電力制御システムとした。

【0010】請求項5にかかる発明は、請求項1乃至4

のいずれか1つに記載の屋内機器電力制御システムにおいて、前記主装置は、前記分電盤の個々の分電ブレーカの容量と前記各家電機器の消費電流に応じて前記各家電機器への給電経路を切り替えるスイッチ装置を具備することを特徴とする屋内機器電力制御システムとした。

【0011】

【発明の実施の形態】図1は本発明の1つの実施形態の屋内機器電力制御システムの全体構成を示すブロック図である。10は屋外から電力線1で受電した電力を電力線2に配電する分電盤、20は電力線2から電力線3への給電経路の切り替えその他を行う主装置である。30は家電機器40が接続される端末装置であり、主装置20から電力線3で配電される電力の家電機器40への給電/遮断の制御その他を行う。50は携帯端末であり、インターネット60を経由して主装置20と接続される。4は制御や監視等のための通信線であり、主装置20と複数の端末装置30との間を接続する。

【0012】図2は分電盤10に接続される主装置20の内部の具体的な構成を示すブロック図であり、電力線2が2A、2B、2Cの3本の場合、電力線3が3A、3B、3Cの3本の場合を示した。主装置20は、3本の電力線2と3本の電力線3の接続の切替を制御するスイッチ装置201と、このスイッチ装置201のスイッチ部を制御するスイッチ制御回路202と、停電時に使用するシステム補助電源としてのバッテリー203と、スイッチ装置201からの給電を受けたりバッテリー203を充電したりバッテリー203を補助電源として機能させる制御等を行う電源制御回路204と、データ処理、データ転送、演算、その他等を行い全体を制御するCPU（中央処理部）205と、本システムの制御のプログラム等が格納されるメモリ206と、設定値等の各種データが格納されるフロッピー（登録商標）ディスク装置、ハードディスク装置、光ディスク装置等の記憶媒体207と、操作指示や状態等を表示する液晶表示部及びタッチ操作入力部を備える画面208と、該画面208の表示を制御する画面表示回路209と、インターネット60との通信を行うモデム等を具備する通信用IF（インターフェース）回路210と、複数の端末装置30との間で信号のやりとりを行うと共に複数の端末装置30に動作の給電を行う端末装置制御回路211と、バスライン212と、給電（電源）ライン213～217とを有する。

【0013】図3は上記した主装置20のスイッチ装置201の具体的な構成を示すブロック図である。スイッチ装置201は、スイッチ制御回路202からの制御信号a3により、分電盤10に接続される電力線2A、2B、2Cと端末装置30に接続される電力線3A、3B、3Cとの接続（給電経路）を切り替える3接点のスイッチ部2011A、2011B、2011Cを具備する。すなわち、電力線2A、2B、2Cは、それぞれ電

力線3A、3B、3Cと接続可能となっており、電力線2A、2B、2Cの電流が規定値（分電盤10の電力線2A、2B、2Cの各ブレーカ容量）を超えないようスイッチ部2011A、2011B、2011Cの切り替えにより、電力線2A、2B、2Cに接続する電力線3A、3B、3Cが選択される。このとき、入力側の1本の電力線に対して出力側の電力線が2本以上接続される場合、例えば、電力線2Aに対して電力線3Aと3Bが接続される場合もある。

10 【0014】図4は端末装置30の具体的な構成を示すブロック図であり、前記した主装置20の端末装置制御回路211に接続される端末装置IF回路301と、電力線3に接続され端末装置IF回路301によりオン/オフが制御されるスイッチ回路302と、スイッチ回路302に流れる負荷電流を検出する電力検知回路303と、スイッチ回路302の負荷側を家電機器40に接続する家電機器IF端子304をと具備する。

【0015】さて、システム動作は初期に投入されたデータに従う。このデータの登録は、図5に示すように、主装置20の画面208又は携帯端末50から、家電機器40の使用優先順位と、電力使用率（実際は契約電流量に対する使用電流の比率）の閾値a（%）、b（%）とを入力して、記憶媒体207に格納する。この記憶媒体207へのデータ書き込みやメモリ206への読み出しはCPU205により行われる。

【0016】上記の家電機器の使用優先順位は、4台の家電機器40A、40B、40C、40Dがあるとすると、ここでは、40B>40C>40D>40Aのように、家電機器40Bが最も優先順位が高く、家電機器40Aが最も優先順位が低くなるよう設定する。電力使用率の閾値aは切替依頼通知や強制スイッチ動作を行う閾値で、1～99（%）の範囲で設定する。電力使用率の閾値bは状態通知（警告等）を行う閾値で、1～99（%）の範囲で設定する。aとbは、a>bの関係にある。ここでは、a=99%、b=90%に設定する。

【0017】基本動作として、CPU205は端末装置制御回路211が受信した各端末装置30からの家電機器40の消費電力情報信号a1と使用者が設定した閾値a、bとに基づいて、プログラム処理と端末装置制御回路211の制御により、制御信号a2を介して個々の端末装置30のスイッチ回路302のオン/オフ制御を個別に行う。また、CPU205は端末装置制御回路211が受信した前記消費電力情報信号a1に基づいて、プログラム処理とスイッチ制御回路202の制御により、制御信号a3を介して、スイッチ装置201のスイッチ部2011A、2011B、2011Cを制御することにより、給電経路の切り替えを行って、電力線2A、2B、2Cのうちの特定のものに電流が集中しないように個々の電流値を調整し、契約電力値の100%付近まで使用率を近づけるよう制御する。

【0018】表示動作として、画面208は画面表示回路209により、文字、図、画像、映像、手書き情報等を表示する。このときスピーカを付属させれば音声通知も行うことができる。設定された電力使用率の閾値a、bを超えた場合やスイッチ回路302の切り替えが行われた場合に、CPU205によるプログラム処理や画面表示回路209の表示制御により、システム運用状態を画面208へ表示する。また、特に電力使用率が閾値aを超えた場合は、CPU205はプログラム処理や画面表示回路209の表示制御により、画面208へ家電機器の給電遮断依頼の表示を行う。なお、画面208へのタッチ操作により、本システムの設定、制御、運用状態読み出しも可能となっている。

【0019】通信動作として、通信用IF回路210はインターネットへ接続するモデム機能を有し、CPU205でのプログラム処理や通信用IF回路210の制御により、通信信号a4とインターネット60を介し、画面208の表示制御と同様に、携帯端末50へ本システム運用の状態や家電機器の給電遮断依頼の通知等を行う。この通信用IF回路210を介して携帯端末50から本システムの制御を行うこともできる。

【0020】電源動作として、CPU205は端末装置制御回路211が受信した消費電力情報信号a1に基づいて、プログラム処理と電源制御回路204の制御により、電源制御回路204への給電ライン214の遮断とバッテリー203からの給電ライン215の接続、又は給電ライン215の遮断と給電ライン214の接続の制御を行う。また、電源制御回路204は、給電ライン213を介して各電子回路へ給電し、スイッチ装置201の給電ライン214による給電がある限り、給電ライン216を介してバッテリー203へ充電を行う。端末装置制御回路211は、給電ライン217を介し各端末装置30に装置動作のための給電を行う。

【0021】次に動作を説明する。図6は本動作における電力使用状態の制御説明図、図7はその動作のフローチャートである。ここで、図7のフローチャート中の処理701、705、706、712、713で適用する電力使用率の閾値a、bは、前記したように、 $a=99\%$ 、 $b=90\%$ とし、家電機器40A、40B、40C、40Dの使用優先順位も前記したように、 $40B>40C>40D>40A$ とする。このとき、使用者からの携帯端末50を使用した制御は無いこととし、図7のフローチャートの処理704、711は動作しないこととする。

【0022】図6において、時刻t1で本システムの給電（主装置20と端末装置30への給電）を開始し、時刻t2で家電機器40Aの給電を行い、時刻t3で家電機器40Bの給電を行い、時刻t4で家電機器40Cの給電を行うと、この時刻t4で電力使用率が設定閾値b（ $=90\%$ ）を超える。このため、図7のステップ70

1がYESとなり、画面208及び通信用IF回路210からの通信信号a4を受ける携帯端末50により、使用者へ、現在給電されている家電機器が40A、40B、40Cであること、及び電力使用率が閾値bを超えたことの警告が通知される処理702が行われる。

【0023】時刻t5で家電機器40Dへの給電を開始すると、電力使用率が設定閾値a（ $=99\%$ ）を超えるため、図7のステップ706がYESとなる。このため、時刻t5'で主装置20の給電ライン213による各電子回路への給電をバッテリー203からの給電ライン215による給電に切り替える処理707、端末装置制御回路211から信号a2を介して末給電の家電機器（電源スイッチがオフ）に接続されている端末装置30のスイッチ回路302を切断する処理708、通信用IF回路210からの通信信号a4と画面208を介し、現在給電している家電機器40A、40B、40C、40Dについての給電遮断依頼通知の処理710が行われる。

【0024】時刻t6で制御信号a2を介して、家電機器40A、40B、40C、40Dの優先順位に従い、最も優先順位の低い家電機器40Aが接続されている端末装置30のスイッチ回路302を遮断する処理713が行われる。この処理713の動作により、電力使用率が主装置20の各電子回路への給電を含めて設定閾値b（ 90% ）以下になると、主装置20の各電子回路への給電を給電ライン214からの給電に切り替える処理714が行われると共に、通信信号a4と画面208を介して、使用者への給電遮断結果通知の処理715が行われる。

【0025】なお、使用者から家電機器の給電遮断命令があった場合には、処理704或いは処理711と共に、電力使用率との比較の処理705或いは処理712に進む。その後の流れはフローチャートに示すとおりである。

【0026】なお、上記実施形態では電力線3と通信回線4とを別にした例について説明したが、エコネットに代表される電力線通信技術により、両線を共通化することも可能である。また、電力使用率の閾値bは2以上設定して、警告に軽重をつけるようにすることもできる。

【0027】

【発明の効果】以上から本発明によれば、家庭の電力消費のピーク値低減を行うことができ、さらに、社会全体の消費電力のピーク値低減が可能となることから、家庭の光熱費の削減、電力会社の設備コスト削減、また設備コスト削減による電力料の低減、そして排出二酸化炭素の削減ができるという利点がある。

【図面の簡単な説明】

【図1】 屋内機器電力制御システムのブロック図である。

【図2】 主装置の具体的構成のブロック図である。

【図3】 主装置内のスイッチ回路の具体的構成のブロック図である。

【図4】 端末装置の具体的構成のブロック図である。

【図5】 初期データ登録の説明図である。

【図6】 電力制御の説明図である。

【図7】 電力制御のフローチャートである。

【符号の説明】

1, 2, 2A, 2B, 2C, 3, 3A, 3B, 3C: 電力線

4: 通信回線

10: 分電盤

20: 主装置、201: スイッチ装置、2011A~2*

* 011C: スイッチ部、202: スイッチ制御回路、203: バッテリ、204: 電源制御回路、205: CPU、206: メモリ、207: 記憶媒体、208: 画面、209: 画面表示回路、210: 通信用IF回路、211: 端末装置制御回路、212: バスライン、213~217: 給電ライン、a1: 消費電力情報信号、a2: 制御信号、a3: 制御信号、a4: 通信信号

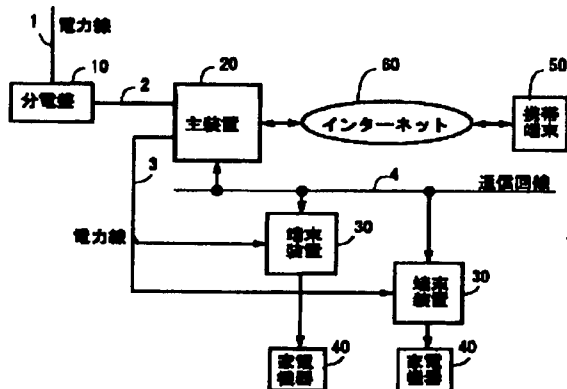
30: 端末装置、301: 端末装置IF回路、302: スイッチ回路、303: 電力検知回路

10 40: 家電機器、40A~40D: 家電機器

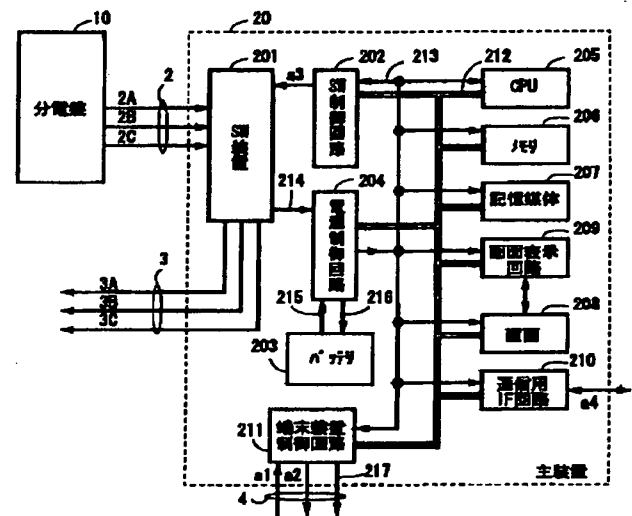
50: 携帯端末

60: インターネット

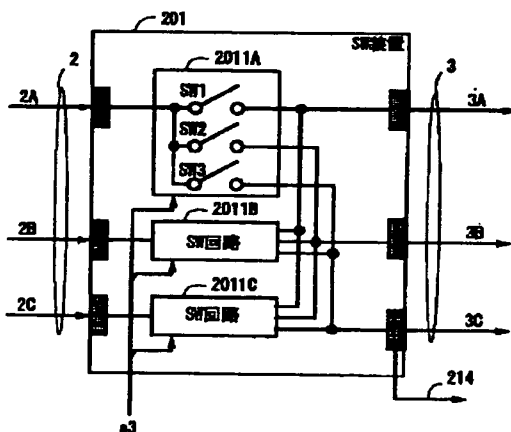
【図1】



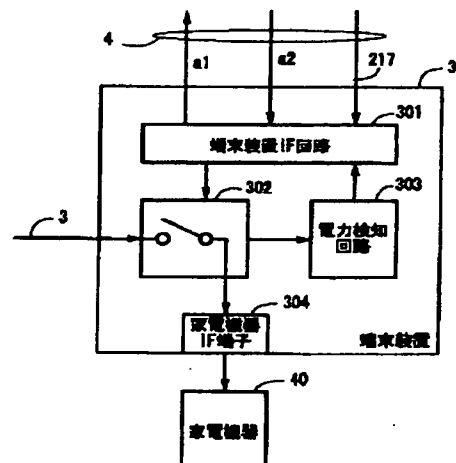
【図2】



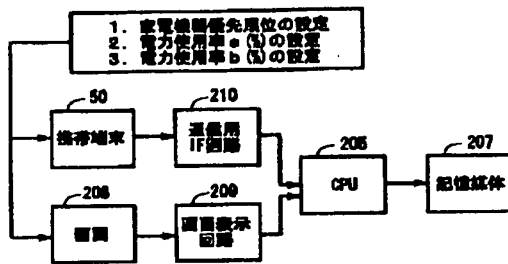
【図3】



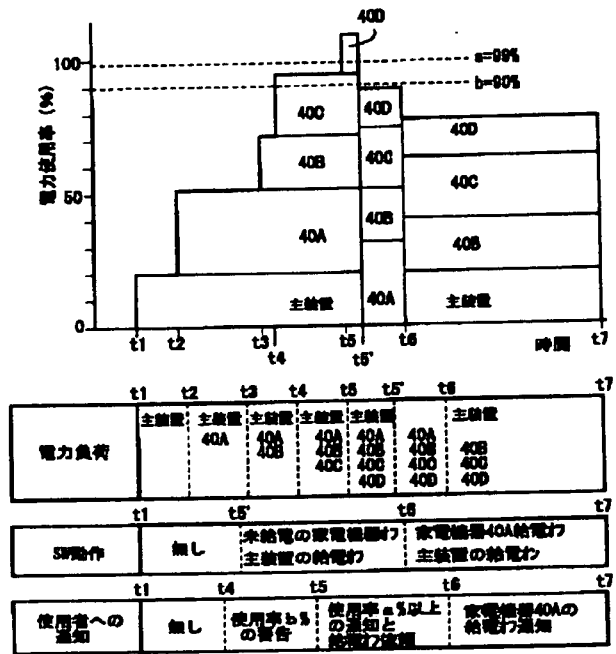
【図4】



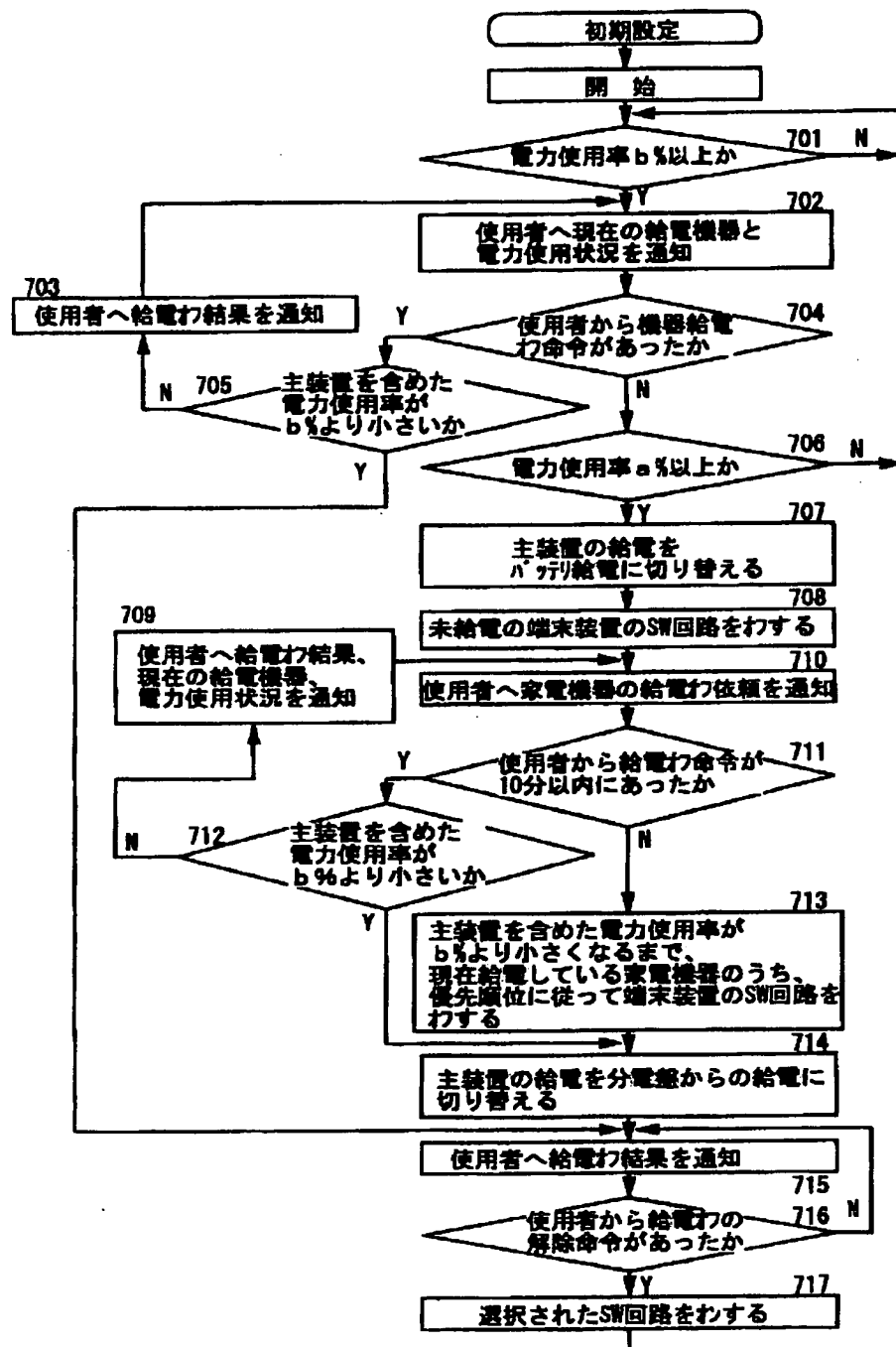
【図5】



【図6】



【図7】



フロントページの続き

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